

Effect of Shoot Retention on the Shoot Characteristics and Yield of Mechanical Plucking Tea Garden

Hun-Yuan Cheng

Summary

The study was conducted to investigate the effect of shoot retention on the shoot characteristic and yield of mechanical plucking tea garden, as mechanical plucking feasibility assessment in shoot retention tea garden. The experiment study proceeded in the Chin-Shin Oolong and TTES No. 12 tea garden at Lungteng, Luyeh district, Taitung. The experiment treatment included (A) whole year mechanical plucking, (B) whole year hand plucking, (C) whole year with three mechanical plucking (mechanical plucking of spring, autumn, winter tea season, shoot retention of other tea seasons), (D) whole year with two mechanical plucking (mechanical plucking of spring, winter tea season, shoot retention of other tea seasons). The results showed that most tea tree canopy of different treatment had no significant difference in Chin-Shin Oolong, whole year mechanical plucking was larger than that hand plucking and shoot retention mechanical plucking in TTES No. 12, to achieve significant difference. Tea shoot and leaf agronomic characteristics of hand plucking and shoot retention mechanical plucking was larger than that whole year mechanical plucking, and with the number of mechanical plucking gradually become obvious. Regardless of the tea season or year, most agronomic characteristics of TTES No. 12 were significant differences in different treatments. Tea shoot density of mechanical plucking was gradually increased in TTES No.12, was higher than that hand plucking, but was not significant difference in Chin-Shin Oolong. The shoot characteristic and density of retention mechanical plucking and hand plucking had no significant difference. The 100 shoot weight and yield of different treatments were not obvious decrease or increase by plucking number in Chin-Shin Oolong, however was significant difference in TTES No. 12 among treatments, shoot yield of whole mechanical plucking was higher.

Key words: Tea garden, Mechanical plucking, Shoot retention, Yield

Effect of Shoot Retention on the Tea Leaves and Made Tea Quality of Mechanical Plucking Tea Garden

Hun-Yuan Cheng

Summary

The study was conducted to investigate the effect of shoot retention on the tea shoot and made tea quality of mechanical plucking tea garden, as mechanical plucking feasibility assessment in shoot retention tea garden. The experiment study conducted in the Chin-Shin Oolong and TTES No. 12 tea garden at Lungteng, Luyeh district, Taitung. The experiment treatment was included (A) whole year

mechanical plucking, (B) whole year hand plucking, (C) whole year with three mechanical plucking (mechanical plucking of spring, autumn, winter tea season, shoot retention of other tea seasons), (D) whole year with two mechanical plucking (mechanical plucking of spring, winter tea season, shoot retention of other tea seasons). The results of the experiment was showed that the distribution of leaf number in the whole year mechanical plucking was gradually concentrated in the lower leaves with the tea season, while the hand plucking and retention mechanical plucking was distributed to the upper layer. The shoot of uniformity whole year mechanical plucking was gradually neat with the number of mechanical plucking. Above one bud four leaves ratio of mechanical plucking was higher and more broken tea stems and broken leaves, one bud two and there leaves ratio was higher by hand plucking. Pouchong tea and green tea had better quality by hand plucking, poor shape of mechanical plucking, tea stems and yellow leaves ratio was higher than the hand plucking. Both plucking had significant difference, The Chin-Shin Oolong and TTES No. 12 had the same trend. The quality score of refining tea was decreased with differences among treatments.

Key words: Tea garden, Mechanical plucking, Shoot retention, Quality

The Review and Future Research Prospects of Tea Mosquito Bug, *Helopeltis* spp. (Heteroptera: Miridae)

Shiou-Ruei Lin

Summary

Tea mosquito bug (*Helopeltis* spp. (Heteroptera: Miridae)) is one of the important piercing-stylet pest of tea in most tea-producing areas. Not only the nymphs but adults could damage the tea shoots and cause yield loss. The damage to tea by tea mosquito bug is not limit to the piercing-stylet sucking sap of young tea shoots. It is also including the oviposition which results in cracks and over-callusing that lead to blockages of the vascular bundles, which affects the physiology and causes stunted growth. So far, there are dozens of alternate host plants for tea mosquito bug. However, the most normally pest control is still using chemical pesticides. It is necessary for avoiding chemical residues and pesticide resistance by using integrated pest management instead of complete using chemical pesticides. Integrated pest management includes cultivation control, mechanical and physical control methods, bio-control and chemical control, etc. And with adjust management strategy, it might be possible to reduce the pesticides utilization and increase the control efficacy, and achieves the goal of maintaining the annual yield and free of chemical residue risks.

Key words: Integrated pest management, Pesticide resistance, Bio-control, Piercing-stylet pest

Monitoring and Safety Evaluation of Pesticide Residues in Tea during 2013-2015

Yu-Ju Huang Shiou-Ruei Lin Jia-Ru Dai Cheng-Chung Huang

Summary

A monitoring program of pesticide residues in tea material from tea field, withering yard, tea processing factory or storage room was performed by the Tea Research and Extension Station (TRES). A total of 5,017 samples were collected during 2013-2015 by Agriculture and Food Agency, TRES and the local county and city government. The samples were prepared by modified CNS 13570-2 or modified QuEChERS and analyzed by GC/MS/MS and LC/MS/MS. The result show that 4,865 of 5,017 tea samples complied with the maximum residue limits (MRLs) set by the Ministry of Health and Welfare (MOHW) in Taiwan. The overall rate of compliance was 97%. The 43 violated samples contained pesticide residues at levels above the MRLs for the given pesticides in tea, while 101 samples contained pesticide residues which were prohibited for use in tea. Another 8 samples were found to be non-compliant in both situations. Most often violated pesticides of residues at levels above the MRLs are acetamiprid, tolfenpyrad, carbaryl and carbofuran while pesticides prohibited for use in tea are ametryn, procymidone and fipronil. The survey results show that pesticide residues in most domestic teas are complied with the MRLs, consumers can drink tea relieved.

Key words: Tea, Pesticide residues, Monitoring

Study on Intercropping Green Manure Crops during Anniversary Tea Plantation

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Hsien-Tsung Tsai

Summary

We planted leguminous green manure seeds when after harvest last year winter tea, summer tea and autumn tea in six-year-old tea garden with Chin-Shin-Dah-Pan cultivar. Before the summer tea, autumn tea, winter tea harvest about 3 weeks, the green manure crops buried in the soil. Compared with the application of soybean meal and Taifei No.1 fertilizer and non-fertilization treatment, investigated the amount of green manure harvest, mineral element, pest, tea quality, cost analysis and green manure supply nitrogen. Select in the season for planting green manure crops and establish the mode of planting green manure crops for year in different seasons for tea garden.

The results showed that the fresh weight of green manure was the highest is in the second quarter (sowing in after summer tea harvest, hoe in before three weeks autumn tea harvest). The second is first quarter of green manure (sowing in after winter tea harvest, hoe in before three weeks in summer tea harvest). The least is the third quarter of green manure (sowing in after autumn harvest, hoe in before three weeks in winter tea harvest). Indian Sesbania had the best growth in summer, Its fresh weight was 29,561 kg per hectare, Lupin (one of the first quarter green manure crops) fresh weight is the highest, there are 11,985 kg / ha. The pests and diseases that occur in green manure crops not spread to tea trees neither increase the density of tea pests and diseases. In the growth period of green manure, there will not cause the decline in the quality of tea, Indian Sesbania can even improve the quality of tea, when the green manure buried in the soil and supply nutrients to tea trees, the tea quality is not only better than the check, it also better than fertilization group. Combine planting the first season and the second

season of green manure crops, green manures can provide the maximum nitrogen amount about 209 kg/ha. The nitrogen fertilizer recommended dosage is 320 kg / ha for 6-year-old tea tree. It is about 2/3 of the amount of nitrogen fertilizer. According to cost prices of soybean meal (27 dollars / kg) to calculate and deduct the cost of seeds, can save about 70,000 dollars cost. Due to low fresh yields for the third quarter green manure, not only can't reduce the cost of fertilizer, but also increase the cost of seeds, it is not recommended planting. Therefore, the tea plantation plan to plant the green manure, it could prior to planting them in summer. There are available to supply more nitrogen fertilizer. The first recommendation to plant is Indian Sesbania, second are KSS10 and TN3, third are TN4 and TN7. If want obtain more nitrogen, can plant green manure crops in after winter tea harvest. The first option is Lupin, second are TN3 and TN7 to supplement the lack of nitrogen fertilizer in summer season.

Key words: Tea Garden, Green manure, Intercropping

Effect of Storage on the Quality and Volatile Compounds of Semi-ball & Fragrance Type Paochong Tea

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Summary

Semi-ball & fragrance type paochong tea was used as experimental material which packaged by vacuum and seal type and stored at -20°C, 4°C, 25°C and 35°C for 18 months. The purpose of this project was to investigate tea quality and volatile compounds changes during storage. The results showed that vacuum package at -20°C storage was good for tea quality and aroma preservation. Volatile compounds were affected by packaging conditions and storage temperature and changed over time. 2-ethyl-furan, (Z)-2-penten-1-ol, 5-tert-butyl-1,3-cyclopentadiene, (E)-2-hexenal, 2-heptanone, (Z)-4-heptenal, 1-octen-3-ol, 2-pentyl-furan, (E,E)-2,4-heptadienal, octanal, isophorone, 3,5-octadiene-2-one, 2,6-dimethyl-cyclohexanol, safranal, 2,6,6-trimethyl-1-cyclohexene-1-acetaldehyde and α -ionone only appear in seal packs, were consistent with oxidative deterioration of the tea during storage. 5-tert-butyl-1,3-cyclopentadiene, 2-heptanone, 2-pentyl-furan and safranal only appear in 25 and 35°C treatments. α -Terpinene, limonene, γ -terpinene, terpinolene only appear in 35°C vacuum treatments. Benzyl alcohol appear in 25 and 35°C vacuum and seal treatments at 18 months. Those compounds were generated when tea stored at higher temperature. During storage, the increase of 1-penten-3-ol, (Z)-2-penten-1-ol, 1-ethyl-1H-pyrrole, (E)-2-hexenal, 2-pentyl-furan, (Z)-4-heptenal, (E,E)-2,4-heptadienal and 3,5-octadiene-2-one, and the decrease of (E)- β -ocimene, (E)-4,8-dimethyl-1,3,7-nonatriene, indole and (E,E)- α -farnesene have negative effect for fragrance type tea.

Key words: Tea, Storage, Volatile compound

Effect of Solvents and Extraction Treatments on the Extraction Efficiency of Catechins, Caffeine and Total Polyphenols of Taiwan Green Tea

Jia-Ru Dai Shiou-Ruei Lin Yu-Ju Huang Meei-Ju Yang

Summary

The purpose of this project is to investigate the effect of solvents on the extraction efficiency of green tea catechins, caffeine and total polyphenols and comparison with the amount by brewing. The results showed that when used 70% methanol and 50% ethanol as the extraction solvents, the extraction efficiency of catechins, caffeine and total polyphenols were better than water, especially for EGCG and ECG. For the tea infusion drinking, water can be the solvent to evaluate the intake of catechins and caffeine in tea. For the comprehensive utilization and economic benefits, about 50% EGCG, ECG and 38.6% EGC still remain in tea wastes after brewing.

Key words: Extraction, Catechins, Total polyphenols

Effect of Microbial Fermentation on Volatile Organic Compounds of Teas

Chih-Chun Kuo Meei-Ju Yang Hsiao-Ping Kuo Shyue-Tsong Huang

Summary

We utilize the microbial fermentation process to develop multi-type flavor tea. The analysis results of gas chromatography-mass spectrometry (GC-MS) prove that only by microbial fermentation process could make tea produce banana, apple, tropical fruits and floral aroma up to 60% of total volatile organic compounds (VOCs), such as 2-methylpropyl ethanoate, 3-methyl butyl acetate, 2-methyl butyl acetate, 3-methylbutyl propionate, cis-3-hexenyl acetate, hexyl acetate, benzyl acetate, and 2-phenylethyl acetate. The sensory evaluation results also show that microbial fermented teas have fruity flavor. Usually, poor quality of tea leaves or inappropriate manufacture process would cause the grassy flavor of tea. The grassy flavor could be improved by microbial fermentation. The GC-MS results show the VOCs which contribute grassy flavor would decrease by 80% after microbial fermentation.

Key words: Microbe, Fermentation, Volatile organic compounds

Effect of Different Cultivar, Tea Type, Drying and

Storage on the Quality and Liquor Color of Raw Material and Made Tea of Taiwan Compressed Tea

Hun-Yuan Cheng

Summary

The purpose of this experiment was to understand the effect of the different cultivar, tea type, drying and storage on the quality and liquor color of raw material and made tea of Taiwan compressed tea, and then to build up the technology of Taiwan special compressed tea. Experimental cultivar includes TTES No. 12, Shiang-Yuan, TTES No. 8 and Yung-Kang wild tea, each of them was manufactured green tea, pouchong tea, red oolong and black tea. Drying treatment includes sun drying and hot air drying (CK). The experiment results showed that the TTES No. 12 was suitable for manufacturing red oolong, pouchong tea and green tea, and Shiang-Yuan was also suitable for manufacturing red oolong of compressed tea. Yung-Kang wild tea and TTES No. 8 was suitable for manufacturing black tea of compressed tea and the qualities of TTES No. 12 and Shiang-Yuan were also better. Black tea and red oolong of big-leaf type cultivar were better than green tea and pouchong tea. After and before of storage was appear the same trend. Pouchong tea and red oolong of small-leaf type cultivar was better than black tea and green tea. After and before of storage was appear the different change. The tea quality of hot air drying was better than that of sun drying without storage. Green tea and pouchong tea of different drying treatment has more significant differences. Red oolong and black tea don't have significant differences. Change of quality was converse after one or two year storage. The L, a, b and ΔE value of loose black tea without the storage don't have significant differences in different drying treatment. The L value decreases after one year storage, most a, b and ΔE values increase. The L, a, b and ΔE values of compressed tea don't have significant differences in different drying treatment. Depend on tea type, the L, a, and ΔE value increase or not in different years. The L, a, and ΔE value of compressed tea has little change than that of loose tea. The change of b value shows little same trend.

Key words: Compressed tea, Raw material, Quality, Liquor color

Effect of Different Cultivar, Tea Type, Drying and Storage on the Chemical Components of Raw Material and Made Tea of Taiwan Compressed Tea

Hun-Yuan Cheng

Summary

The purpose of this experiment was to understand the effect of different cultivar, tea types, drying and storage on the chemical components of raw materials and made tea of Taiwan compressed tea, and then to build up the technology of Taiwan special compressed tea. Experimental cultivar include TTES No. 12, Shiang-Yuan, TTES No. 8 and Yung-Kang wild tea, each of them was manufactured green tea,

pouchong tea, red oolong and black tea. Drying treatment includes sun drying and hot air drying (CK). The experiment result showed that the soluble solid, polyphenols, catechins, soluble sugar and amino acid content have decreased trend after one year of storage, caffeine content depends on the tea type and cultivar and then increases or decreases. There are changes of soluble solid, polyphenols and catechins content of different drying. Four cultivars had same trend. The changes of these chemical components by hot air drying were higher than those by sun drying. The change of caffeine, soluble sugar and amino acid content depends on the tea type and cultivar. The black tea of different drying treatment on the chemical component presents more significant differences, other teas present little differences.

Key words: Cultivar, Tea type, Drying, Storage, Compressed tea, Chemical component

A Study on the Competency Standard and Ability Identification of Tea Sensory Evaluation Tasters

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Summary

Tea Research and Extension Station (TRES) used competency standard of tea sensory evaluation built in 2015 as the basis for tea taster education and training and established the license system. TRES utilized the Farmers Academy Platform to conduct the elementary class of tea sensory evaluation in 2016. By training and test together way to promote the tea sensory evaluation Competency Certification system, the training expires and pass through the discipline and technique tests who can be awarded identification certificate of elementary Tea sensory evaluation professional talent ability. This ability identification is based on the Competency Standard of tea sensory evaluation formulated by the expert meeting. Then divided into five levels, namely, Elementary, Intermediate, High-Intermediate, Advanced, Superior, based on the degree of difficulty of each ability level. Every level of different ability possess different identify indicators and certification qualifications. To identify those for the taster of tea sensory who has passed through the Elementary, Intermediate, High-Intermediate ability identification, to identify those for the master of tea sensory who has passed through the Advanced, Superior ability identification. Through the implementation of this certification system, to encourage tea industry practitioners to strengthen self-professional tea knowledge and technology, thereby enhancing their industrial business competitiveness.

Key words: Tea, Sensory Evaluation, Competency standard, Ability identification